

A single shell of *Lymnaea dalli* (Baker) was found in a meadow just east of the isthmus, clinging like a land shell to the under side of a piece of wood. The pool of the isthmus has been ruined for shell life by the application of oil, and probably no fresh-water shells now inhabit any enclosed water on Put-in-Bay Island.

Kelley's Island, about five miles southeast of Put-in-Bay, was partially explored. It yielded:

*Polygyra albolabris* (Say), ordinary light-colored form;  
*Polygyra albolabris* (Say), reddish form in marshy woods.  
*Polygyra zaleta* (Binn.); *Polygyra thyroidus* (Say); *Polygyra profunda* (Say); *Polygyra fraudulenta* Pils.; *Polygyra inflecta* (Say);  
*Polygyra multilineata* (Say); *Polygyra monodon* (Rack.).

*Vallonia pulchella* (Müll.).

*Bifidaria armifera* (Say); *Bifidaria contracta* (Say); *Bifidaria holzingeri* Sterki.

*Zonitoides arborea* (Say).

*Pyramidula solitaria* (Say); *Pyramidula alternata* (Say).

*Helicodiscus parallelus* (Say).

*Succinea avara* Say; *Succinea retusa* Lea.

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#### ON THE CLASSIFICATION OF THE LYMNÆIDS.

BY FRANK C. BAKER.

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Recently several interesting contributions have appeared which contain valuable data bearing on the classification of the family *Lymnæidæ*. These treat somewhat critically of the previous classifications which have been attempted. Roszkowski<sup>1</sup> presents a handsomely illustrated paper full of data on the structural and biological aspects of the *Lymnæas* of Lac Léman. This lake has already provided material for the pens of several distinguished malacologists; among them Forel and Brot. Roszkowski's researches add greatly to what we already know concerning the deep-water and littoral fauna of this interesting lake.

<sup>1</sup> Contribution à l'étude des Linnées du Lac Léman. Revue Suisse de Zoologie, xxii, No. 15, July, 1914, pages 457-539, plates 14-17.

In the first part of this paper (anatomical and systematic) the author describes the anatomy, radula and genitalia of *Lymnæa stagnalis*, *Radix auricularia* and *ovata*, and *Galba palustris*. It is apparent that there is great variability in the radula of many of the species of Lymnæids. In the paper in question, *auricularia* is described and figured with both bicuspid and tricuspid laterals, the first lateral being invariably tricuspid. In the individuals of the American form (introduced) which have been examined, the first lateral was always tricuspid, but the balance were bicuspid or with a small entoconic swelling. *Palustris* in Roszkowski's paper has both bicuspid and tricuspid laterals, while in the American form examined the laterals have in all cases been bicuspid. This is true also of *reflexa*, *emarginata*, *catascopium* and others of this group. As remarked elsewhere, the writer has not been able to observe a normal central tooth of Lymnæa which was other than unicuspid, though several pathological examples have been seen in which there were one or more side cusps. Very high powers have been used and great care has been exercised in making examinations.

In order to verify the form of teeth of American Lymnæas published by the writer, several species, among them *palustris*, *reflexa*, *mighelsi*, *danielsi*, *stagnalis*, *auricularia*, *obrussa*, and *columella*, were reexamined, and no deviation from the published figures was observed. All of the lateral teeth of the *palustris* group were bicuspid. *Stagnalis* has a slight endoconic swelling which might be taken for a typical cusp. If the difference pointed out by Roszkowski for both *stagnalis* and *palustris* would prove stable there might be grounds for separating the European and American species, in which cases the latter species would become *appressa* Say and *nuttalliana* Lea. In *auricularia* the lateral teeth vary as shown by Roszkowski (plate 16, figs. 183-186) being, according to this author normally tricuspid though sometimes with the first lateral tricuspid and the balance bicuspid, as figured by the present writer. Upon reexamination, the laterals of the Lincoln Park specimens were found to be as figured by the writer and by Roszkowski on plate 16 figure 183.

Additional comparative studies are needed in which many individual radulae are observed to ascertain the amount of var-

iation and whether this variation increases with wear and age. Biometric studies upon hundreds of radulae would be of great service. A variable radula renders tooth formulas of little value as has been stated by Roszkowski. In the American species examined this variability has been of such small percentage as to cause little or no difficulty in placing species in their appropriate groups.

The genitalia seem to provide characters of greater stability than do the radulae. The genitalia of the European and American species agree in all essential details and it seems true that these organs offer characters sufficiently stable for the separation of groups of species as has already been done in the writer's monograph of this family. Some years ago the opinion was expressed in a letter to Roszkowski, that the short, pyriform receptaculum seminis without long canal which is found in *ovata* Drap and *profunda* Clessin would seem to provide a character of group importance (see Roszkowski, plate 17, figs. 196-197). The length of the epiphallus allies these species with *auricularia* in the genus *Radix*. The writer hesitates to add another name to this already overburdened family, and simply suggests that this character may be found of value in a future classification should it occur in other species. This form of receptaculum seminis has not been observed in any American species of *Lymnaea*. Roszkowski's paper is a valuable contribution to our knowledge of the *Lymnaeas* and similar studies on other species (American as well as European) would greatly aid in providing reliable data for a satisfactory classification of this family. We wish that some American post-graduate student would elect such a theme for his doctorate dissertation.

In a recent paper,<sup>1</sup> Mr. Harold S. Colton publishes some valuable suggestions on the classification of the *Lymnaeids*. While the writer would not for a moment claim that he has said the last word on the classification of this family, he does not believe that anything would be gained by a return to the old use of the name *Lymnaea*. While the differences proposed for the separation of the names admitted to generic rank in the

<sup>1</sup> NAUTILUS XXVIII, pages 116-120, Feb., 1915.

writer's monograph are slight, they have thus far proven reasonably stable. In any classification it must be the sum-total of characters that provide diagnostic features of value, and even if these be small they are sufficient if they include certain groups to the exclusion of others. No single character, as the radula or the genitalia, will prove satisfactory. A case in point is *Radix*, in which the lateral teeth of the radula are now known to be either bi- or tricuspid. As the writer stated in his monograph diagnostic features must be based on the sum of the characters presented by the shell, radula, genitalia, or other organs. Colton says "our present knowledge will not allow us to make a comprehensive classification of the Lymnaeids based on the anatomy of the snail." This result cannot be attained by recasting the data now available, but rather by the addition of new data on old species or on species now unknown anatomically.

The writer can by no means agree with the statement made twice in this paper that generic names should not be added unless based on undebatable grounds because of the inconvenience to the cataloger. If this criticism should be recognized we would revert to the use of many of the older names in the Pulmonata as well as in the Naiades. It is recognized, of course, that generic subdivision can be overdone, but in the advancement of science the convenience of the cataloger or teacher is not considered. Generic or other divisional names are simply for the purpose of bringing together groups of similar organisms which we designate as genera, subgenera or sections. In some cases the criteria for the separation of these genera will be of a distinct and decided character; while in others, where there are many species of similar characteristics, these distinctions will necessarily be founded on data of a less decided character. Such a condition obtains in the family under discussion and whatever the criteria used for the separation of genera or other groups, they can apparently be of only quantitative character. The relative value of these criteria will vary with the importance ascribed to them by different authors.

We welcome all additions to knowledge and we know full well that the work of yesterday is rendered obsolete by the work of to-morrow, but the writer cannot see how the reduction to

subgenera and sections of the names used as genera and subgenera in the monograph in question advances our knowledge of the family any more than the raising of a number of subgenera and sections to generic rank, as Colton believes the writer to have done in his monograph. This rather resembles a game of see-saw!

The provisional key of Colton (page 119) is good, and the writer would also be interested to know how useful it may prove to the workers in this family. We would suggest that there is a vast fund of useful information to be acquired from a biometric study of both the radula and the genitalia of the *Lymnaeas*. If we knew the range and the relative amount of variation of these organs we could more intelligently use these criteria for purposes of classification. An abundance of time is needed for this work but the results would compensate for the time expended. The studies which have thus far been made upon this family serve to emphasize the one fact which stands out clearly, the great variability of the shells and organs of the fresh-water pulmonates, a condition in strong contrast with the terrestrial pulmonata where the radulæ and genitalia are much more stable in character and hence more satisfactory for purposes of classification.

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#### PUBLICATIONS RECEIVED.

AN INDEX TO THE MUSEUM BOLTENIANUM. By Wm. H. Dall. Smithsonian Institution Publication No. 2360. The republication of Bolten's work by Messrs. Sherborn and Sykes (1906) made it accessible to conchologists generally, but its use has been difficult on account of the absence of any index to the great number of names, combined with the unfamiliar nomenclature, which often made even well-known Linnæan species hard to find. Dr. Dall has very appreciably lightened this labor by a full and cross-referenced index. It is prefaced by a historical account of the work, a discussion of its nomenclature, and translations of the Latin Preface and the German Introductions. The Institution desires to give the widest usefulness to this Index, and will supply copies to all who may be interested.—H. A. P.